

HK NATER TECH LIMITED

AR1021X-Module Specification

Customer: _____

Description: AR1021X-Module

Customer P/N: _____

Date: _____

Customer		
Approve	Auditing	Admit

Provider		
Approve	Auditing	Admit

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USB Product Specification

IEEE 802.11a/b/g/n

2.4 to 5.8GHz 2T2R WiFi Module

NT-AR1021X-Module-V1.2-C

Version 1.0

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1. Product Overview

The module NT-AR1021X-Module-V1.2-C provides wireless modem functionality for CE applications utilizing direct sequence spread spectrum and OFDM/CCK technology. The module support IEEE 802.11a/b/g/n protocol. The module integrates all wifi functionality in a package friendly to low-cost PCB design, requiring only a external 3.3V power supply and connection to antenna.

The module is based on QualcommAtheros AR1021X which is highly integrated,system-on-a-chip solution for 2.4/5GHz IEEE 802.11n 2x2 MIMO WLAN with internal PA and LNA.

1.1 Application scope

The wireless module is compliant to IEEE 802.11b and IEEE 802.11a/g and IEEE 802.11n standard. The data rate of 802.11b is up to 11Mbps and fallback rates of 5.5, 2, 1Mbps.The data rate of 802.11a/g is up to 54Mbps and fallback rates of 48,36,24,18,12,9, 6Mbps.The data rate of 802.11n HT20 with 800ns GI is up to 65Mbps and fallback rates of 58.5,52, 39, 26, 19.5, 13, 6.5Mbps; the data rate of 802.11n HT20 with 400ns GI is up to72.2Mbps and fallback rates of 65, 57.8, 43.3, 28.9, 21.7, 14.4, 7.2Mbps. The data rate of802.11n HT40 with 800ns GI is up to 135Mbps and fallback rates of 121.5, 108, 81, 54,40.5, 27, 13.5Mbps.

1.2 Regulation of Each Countries

The Product must be complied with the radio requirement of

-USA: FCC Part15C compatible

-EN 300328, EN301489 certified before marketing Europe.

-Japan TELEC certified before marketing Japan

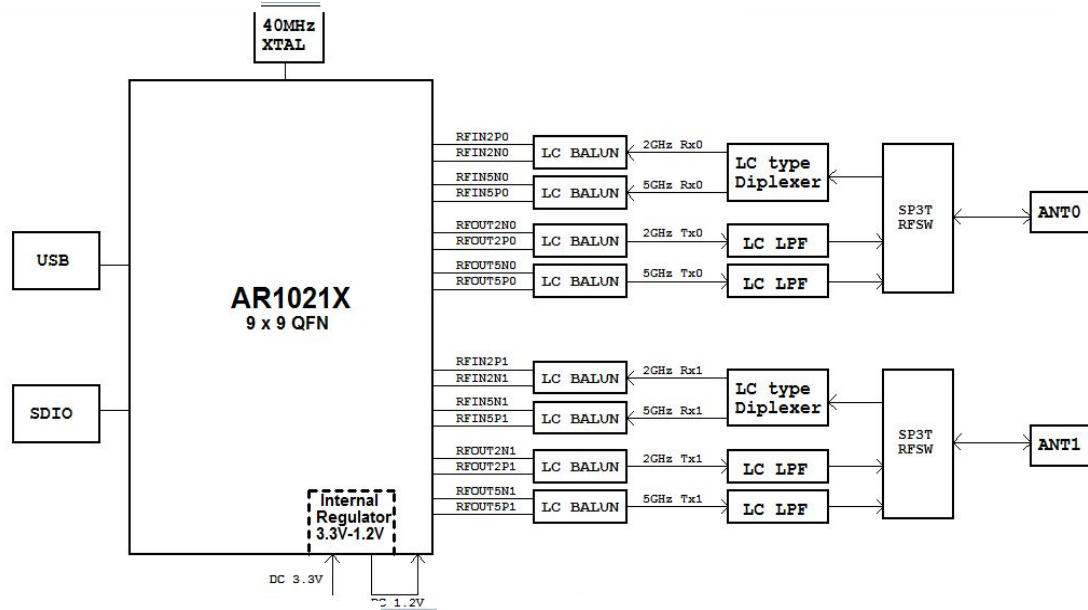
Certification ID Number		
Country	Standard	ID/MARK
US	FCC P15C	TBD
CE	EN 300328 V1.7.1/ 301489-1and-17/60950-1	TBD
JAPAN	ARIB-T66/T33	TBD

Note: Above regulations are representative examples. The module should get an approval by more countries.

2. Module Hardware Overview

2.1 Block Diagram

The general Hardware architecture is shown below Figure:



Module Block Diagram

2.2 Features

- ◆ IEEE802.11a/ b/g/n (2X2) based on QualcommAtheros AR1021X solution
- ◆ USB 2.0 Interface, High and Full Speeds supported
- ◆ Module is powered by the host with a 3.3V +/- 10% supply.
- ◆ 4 layers through hole PCB design with high Tg (170 degrees) FR4 material

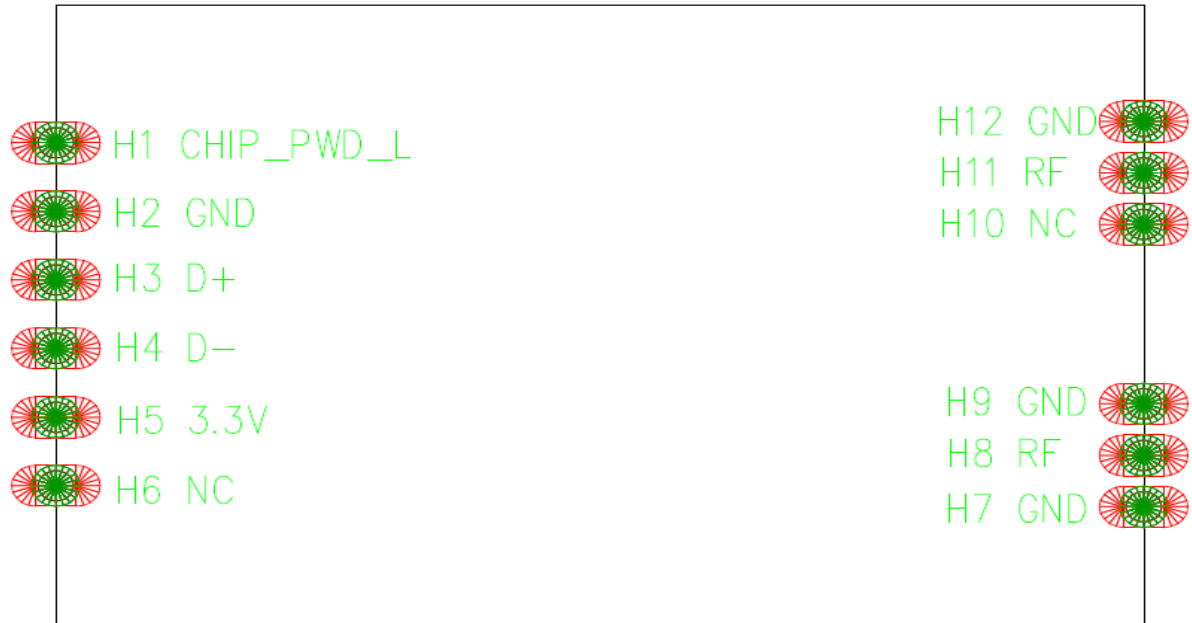
2.3 Interface

◆ Interface

■ 12pin connector

■ Antenna: IPEX connector

◆ Pin definition



From Module TOP View

Pin Number	Symbol Name	Status	Pin Description
1	CHIP_PWD_L	I	Reset, low active
2	GND	P	Ground pad
3	USB_DP	I/O	USB D+ signal
4	USB_DN	I/O	USB D- signal
5	3.3V	P	Analog 3.3V power supply
6	NC	/	Reverse, please keep it floating
7	GND	P	Ground pad
8	RF1	O	RF output1, connect to external antenna
9	GND	P	Ground pad
10	GND	P	Ground pad
11	RF2	O	RF output2, connect to external antenna
12	GND	P	Ground pad

PIN1 CHIP_PWD_L: Chip power-down control

3. Electrical Specification

3.1 Recommended operating rating

Element	Symbol	Min	Typ	Max	Unit
DC supply voltage	UV+	3.0	3.3	3.6	(V)

3.2 DC Characteristics

symbol	Parameter	Min	Typ	Max	Unit
STBY 3.3V	Supply voltage	3.0	3.3	3.6	(V)
	Power Saving	--	450	--	(uA)
	Standby	--	112	--	(mA)
	Continuous Tx Current 2.4GHz(Dual Chain)	--	310	--	(mA)
	Continuous Rx Current 2.4GHz(Dual Chain)	--	56	--	(mA)
	Continuous Tx Current 5GHz(Dual Chain)	--	480	--	(mA)
	Continuous Rx Current 5GHz(Dual Chain)	--	60	--	(mA)

3.3 Environment Storage Condition

Environment condition	
Temperature	Operating Temperature: -10 deg.C ~70 deg.C
	Storage Temperature: -40 deg.C ~80 deg.C
Humidity	Operating Humidity: 5% ~95% (Non-condensing)
	Storage Humidity: 5% ~95% (Non-condensing)

4. RF Specification

4.1 IEEE 802.11b

Items	Contents			
Specification	IEEE 802.11b			
Modulation technique	DSSS/CCK			
Channel	CH1 ~ CH13			
Data rate	1,2,5.5,11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels(SISO)				
1)Target Power@1Mbps	15	17	19	dBm
2)Target Power@2Mbps	15	17	19	dBm
3)Target Power@5.5Mbps	15	17	19	dBm
4)Target Power@11Mbps	15	17	19	dBm
2. Spectrum Mask@Target Power				
1) $f_c - 33\text{MHz} < f < f_c - 22\text{MHz}$	-	-	-50	dBr
2) $f_c - 22\text{MHz} < f < f_c - 11\text{MHz}$	-	-	-30	dBr
3) $f_c + 11\text{MHz} < f < f_c + 22\text{MHz}$	-	-	-30	dBr
4) $f_c + 22\text{MHz} < f < f_c + 33\text{MHz}$	-	-	-50	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) 1Mbps	-		-10	dB
2) 2Mbps	-		-10	dB
3) 5.5Mbps	-		-10	dB
4) 11Mbps	-		-10	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) 1Mbps(PER ≤ 8%)	-	-97	-94	dBm
2) 2Mbps(PER ≤ 8%)	-	-94	-90	dBm
3) 5.5Mbps(PER ≤ 8%)	-	-92	-89	dBm
4) 11Mbps(PER ≤ 8%)	-	-90	-87	dBm
6. Maximum Input Level (PER ≤ 8%)	-10	-	-	dBm

4.2 IEEE 802.11g

Items	Contents			
Specification	IEEE 802.11g			
Modulation technique	OFDM			
Channel	CH1 ~ CH13			
Data rate	6,9,12,18,24,36,48,54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels(SISO)				
1)Target Power@6Mbps	15	17	19	dBm
2)Target Power@9Mbps	15	17	19	dBm
3)Target Power@12Mbps	15	17	19	dBm
4)Target Power@18Mbps	15	17	19	dBm
5)Target Power@24Mbps	15	17	19	dBm
6)Target Power@36Mbps	14	16	18	dBm
7)Target Power@48Mbps	13	15	17	dBm
8)Target Power@54Mbps	12	14	16	dBm
2. Spectrum Mask@Target Power				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
3) at $f_c > \pm 30\text{MHz}$	-	-	-40	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) 6Mbps	-		-5	dB
2) 9Mbps	-		-8	dB
3) 12Mbps	-		-10	dB
4) 18Mbps	-		-13	dB
5) 24Mbps	-		-16	dB
6) 36Mbps	-		-19	dB
7) 48Mbps	-		-22	dB
8) 54Mbps	-	-33	-25	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) 6Mbps(PER < 10%)	-	-94	-90	dBm
2) 9Mbps(PER < 10%)	-	-93	-89	dBm
3) 12Mbps(PER < 10%)	-	-92	-88	dBm
4) 18Mbps(PER < 10%)	-	-90	-86	dBm
5) 24Mbps(PER < 10%)	-	-86	-82	dBm
6) 36Mbps(PER < 10%)	-	-83	-79	dBm
7) 48Mbps(PER < 10%)	-	-78	-75	dBm
8) 54Mbps(PER < 10%)	-	-75	-72	dBm
6. Maximum Input Level (PER < 10%)	-20	-	-	dBm

4.3 IEEE 802.11n HT20(2.4G)

Items	Contents			
Specification	IEEE 802.11n HT20			
Modulation technique	OFDM			
Channel	CH1 ~ CH13			
Data rate	MCS0 ~ MCS15			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels				
1)Target Power@MCS0	15	17	19	dBm
2)Target Power@MCS1	15	17	19	dBm
3)Target Power@MCS2	15	17	19	dBm
4)Target Power@MCS3	15	17	19	dBm
5)Target Power@MCS4	14	16	18	dBm
6)Target Power@MCS5	13	15	17	dBm
7)Target Power@MCS6	12	14	16	dBm
8)Target Power@MCS7	11	13	15	dBm
2. Spectrum Mask@14dBm				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
3) at $f_c > \pm 30\text{MHz}$	-	-	-45	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) MCS0	-		-5	dB
2) MCS1	-		-10	dB
3) MCS2	-		-13	dB
4) MCS3	-		-16	dB
5) MCS4	-		-19	dB
6) MCS5	-		-22	dB
7) MCS6	-		-25	dB
8) MCS7	-	-31	-28	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0(PER < 10%)	-	-94	-90	dBm
2) MCS1(PER < 10%)	-	-91	-87	dBm
3) MCS2(PER < 10%)	-	-89	-85	dBm
4) MCS3(PER < 10%)	-	-85	-82	dBm
5) MCS4(PER < 10%)	-	-81	-77	dBm
6) MCS5(PER < 10%)	-	-77	-73	dBm
7) MCS6(PER < 10%)	-	-75	-70	dBm
8) MCS7(PER < 10%)	-	-73	-67	dBm
6. Maximum Input Level (PER < 10%)	-20	-	-	dBm

4. 4 IEEE 802.11n HT40(2.4G)

Items	Contents			
Specification	IEEE 802.11n HT40			
Modulation technique	OFDM			
Channel	CH3 ~ CH11			
Data rate	MCS0 ~ MCS15			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels				
1)Target Power@MCS0	14	16	18	dBm
2)Target Power@MCS1	14	16	18	dBm
3)Target Power@MCS2	14	16	18	dBm
4)Target Power@MCS3	14	16	18	dBm
5)Target Power@MCS4	13	15	17	dBm
6)Target Power@MCS5	12	14	16	dBm
7)Target Power@MCS6	11	13	15	dBm
8)Target Power@MCS7	10	12	14	dBm
2. Spectrum Mask@14dBm				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBm
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBm
3) at $f_c > \pm 30\text{MHz}$	-	-	-45	dBm
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) MCS0	-		-5	dB
2) MCS1	-		-10	dB
3) MCS2	-		-13	dB
4) MCS3	-		-16	dB
5) MCS4	-		-19	dB
6) MCS5	-		-22	dB
7) MCS6	-		-25	dB
8) MCS7	-	-32	-28	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0(PER < 10%)	-	-91	-87	dBm
2) MCS1(PER < 10%)	-	-88	-84	dBm
3) MCS2(PER < 10%)	-	-86	-82	dBm
4) MCS3(PER < 10%)	-	-82	-79	dBm
5) MCS4(PER < 10%)	-	-79	-74	dBm
6) MCS5(PER < 10%)	-	-74	-70	dBm
7) MCS6(PER < 10%)	-	-72	-69	dBm
8) MCS7(PER < 10%)	-	-70	-65	dBm
6. Maximum Input Level (PER < 10%)	-20	-	-	dBm

4.5 IEEE 802.11a

Items	Contents			
Specification	IEEE 802.11a			
Modulation technique	OFDM			
Channel	5180 ~ 5825MHz			
Data rate	6,9,12,18,24,36,48,54Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels(SISO)				
1)Target Power@6Mbps	14	16	18	dBm
2)Target Power@9Mbps	14	16	18	dBm
3)Target Power@12Mbps	14	16	18	dBm
4)Target Power@18Mbps	14	16	18	dBm
5)Target Power@24Mbps	14	16	18	dBm
6)Target Power@36Mbps	12	14	16	dBm
7)Target Power@48Mbps	10	12	14	dBm
8)Target Power@54Mbps	9	11	13	dBm
2. Spectrum Mask@Target Power				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
3) at $f_c > \pm 30\text{MHz}$	-	-	-40	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) 6Mbps	-		-5	dB
2) 9Mbps	-		-8	dB
3) 12Mbps	-		-10	dB
4) 18Mbps	-		-13	dB
5) 24Mbps	-		-16	dB
6) 36Mbps	-		-19	dB
7) 48Mbps	-		-22	dB
8) 54Mbps	-	-30	-25	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) 6Mbps(PER < 10%)	-	-94	-90	dBm
2) 9Mbps(PER < 10%)	-	-93	-89	dBm
3) 12Mbps(PER < 10%)	-	-92	-88	dBm
4) 18Mbps(PER < 10%)	-	-89	-85	dBm
5) 24Mbps(PER < 10%)	-	-86	-82	dBm
6) 36Mbps(PER < 10%)	-	-82	-78	dBm
7) 48Mbps(PER < 10%)	-	-78	-74	dBm
8) 54Mbps(PER < 10%)	-	-77	-71	dBm
6. Maximum Input Level (PER < 10%)	-30	-	-	dBm

4. 6 IEEE 802.11n HT20(5G)

Items	Contents			
Specification	IEEE 802.11a/n HT20			
Modulation technique	OFDM			
Channel	5180 ~ 5825MHz			
Data rate	MCS0 ~ MCS15			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels				
1)Target Power@MCS0	14	16	18	dBm
2)Target Power@MCS1	13	15	17	dBm
3)Target Power@MCS2	13	15	17	dBm
4)Target Power@MCS3	13	15	17	dBm
5)Target Power@MCS4	12	14	16	dBm
6)Target Power@MCS5	11	13	15	dBm
7)Target Power@MCS6	10	12	14	dBm
8)Target Power@MCS7	8	10	12	dBm
2. Spectrum Mask@14dBm				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
3) at $f_c > \pm 30\text{MHz}$	-	-	-45	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) MCS0	-		-5	dB
2) MCS1	-		-10	dB
3) MCS2	-		-13	dB
4) MCS3	-		-16	dB
5) MCS4	-		-19	dB
6) MCS5	-		-22	dB
7) MCS6	-		-25	dB
8) MCS7	-	-30	-28	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0(PER < 10%)	-	-93	-89	dBm
2) MCS1(PER < 10%)	-	-91	-87	dBm
3) MCS2(PER < 10%)	-	-88	-84	dBm
4) MCS3(PER < 10%)	-	-83	-79	dBm
5) MCS4(PER < 10%)	-	-80	-76	dBm
6) MCS5(PER < 10%)	-	-76	-72	dBm
7) MCS6(PER < 10%)	-	-75	-70	dBm
8) MCS7(PER < 10%)	-	-73	-67	dBm
6. Maximum Input Level (PER < 10%)	-30	-	-	dBm

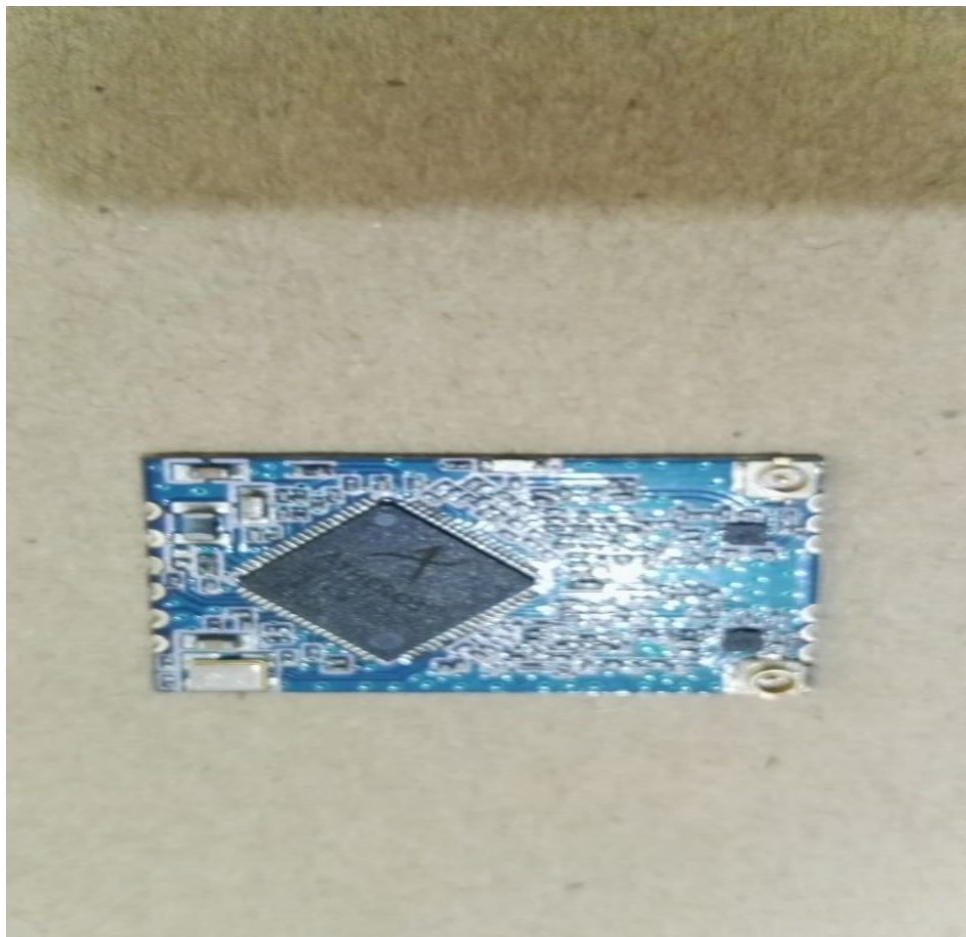
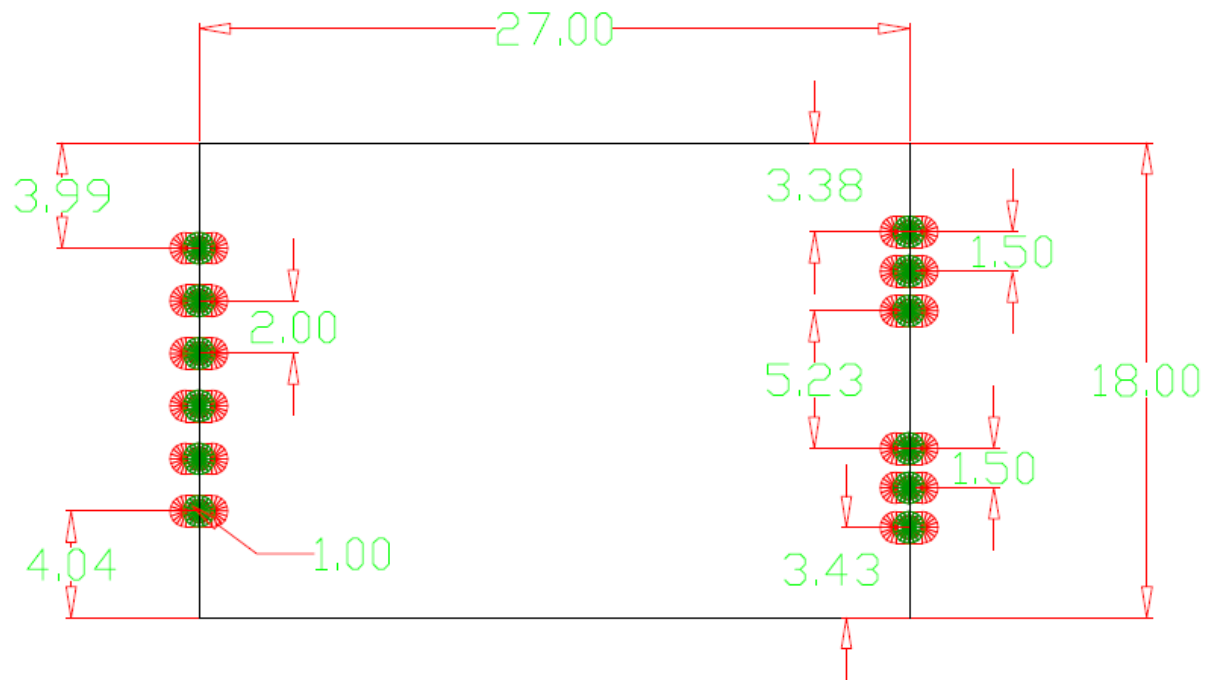
4.7 IEEE 802.11n HT40(5G)

Items	Contents			
Specification	IEEE 802.11a/n HT40			
Modulation technique	OFDM			
Channel	5190 ~ 5815MHz			
Data rate	MCS0 ~ MCS15			
TX Characteristics	Min.	Typ.	Max.	Unit
1. Power Levels				
1)Target Power@MCS0	12	14	16	dBm
2)Target Power@MCS1	11	13	15	dBm
3)Target Power@MCS2	11	13	15	dBm
4)Target Power@MCS3	11	13	15	dBm
5)Target Power@MCS4	11	13	15	dBm
6)Target Power@MCS5	10	12	14	dBm
7)Target Power@MCS6	9	11	13	dBm
8)Target Power@MCS7	7	9	11	dBm
2. Spectrum Mask@14dBm				
1) at $f_c \pm 11\text{MHz}$	-	-	-20	dBr
2) at $f_c \pm 20\text{MHz}$	-	-	-28	dBr
3) at $f_c > \pm 30\text{MHz}$	-	-	-45	dBr
3. Frequency Error	-20	-	+20	ppm
4. Modulation Accuracy(EVM)@Target Power				
1) MCS0	-		-5	dB
2) MCS1	-		-10	dB
3) MCS2	-		-13	dB
4) MCS3	-		-16	dB
5) MCS4	-		-19	dB
6) MCS5	-		-22	dB
7) MCS6	-		-25	dB
8) MCS7	-	-31	-28	dB
RX Characteristics	Min.	Typ.	Max.	Unit
5. Minimum Input Level Sensitivity				
1) MCS0(PER < 10%)	-	-89	-85	dBm
2) MCS1(PER < 10%)	-	-87	-83	dBm
3) MCS2(PER < 10%)	-	-84	-80	dBm
4) MCS3(PER < 10%)	-	-80	-76	dBm
5) MCS4(PER < 10%)	-	-77	-73	dBm
6) MCS5(PER < 10%)	-	-73	-69	dBm
7) MCS6(PER < 10%)	-	-71	-67	dBm
8) MCS7(PER < 10%)	-	-70	-64	dBm
6. Maximum Input Level (PER < 10%)	-30	-	-	dBm

5. Mechanical Specifications

PCB Assembly Dimension:

- ◆ Dimension (W x L x H): 27m x 18mm x 2.3mm

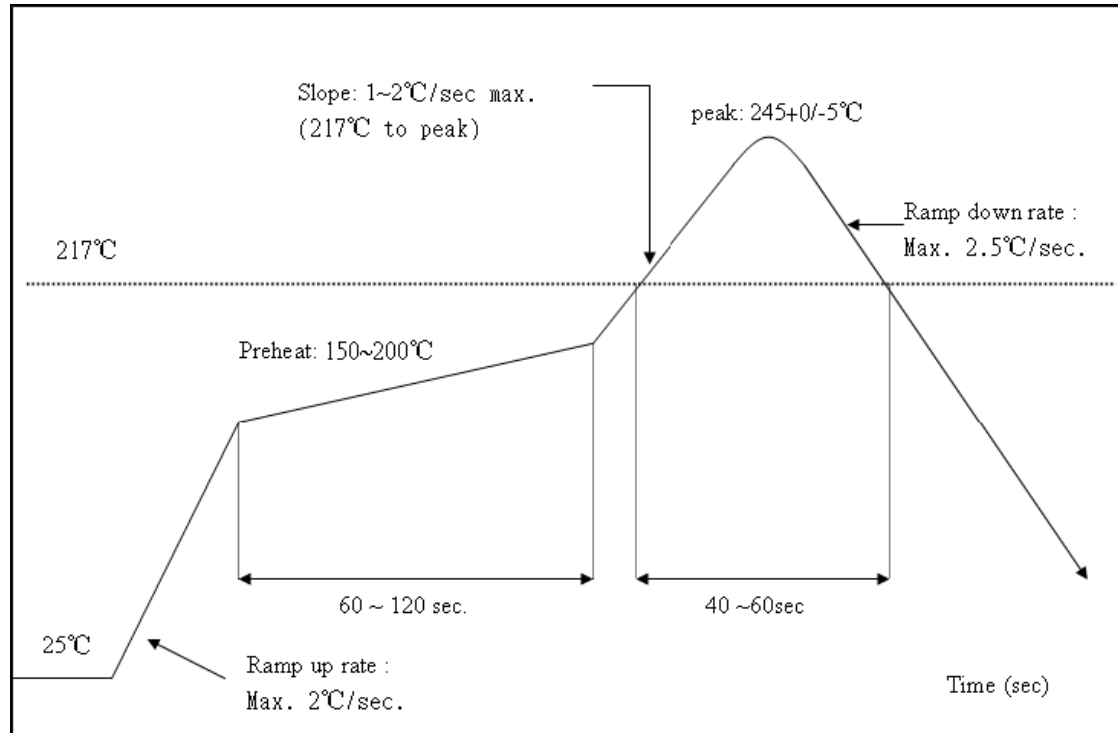


6. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<250^{\circ}\text{C}$

Number of Times : ≤ 2 times



ENVIRONMENTAL

Operating

Operating Temperature: 0°C to +70 °C
Relative Humidity: 5-90% (non-condensing)

Storage

Temperature: -40°C to +80°C (non-operating)
Relevant Humidity: 5-95% (non-condensing)

MTBF caculation

Over 150,000hours